

THE
ANTIQUITY AND DURATION
OF THE
W O R L D.



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BY
G. H. TOULMIN, M. D.

L O N D O N:
PRINTED FOR T. CADELL, IN THE STRAND.
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INTRODUCTION.

IN writing upon a subject, extensive and important in its nature, so nearly interesting to every denomination of men, and upon which nothing satisfactory has hitherto been offered to the world, the Author is sensible that he has engaged himself in an arduous undertaking. At a period when a liberality of sentiment predominates, when men, emerging from obscurity,

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scurity, eagerly relinquish the errors and prejudices of their ancestors, something on the present subject seemed absolutely necessary, to give still greater consistency to the reasonings and speculations of mankind.

To impress us with an adequate idea of the nature and extent of animal and vegetable life, the continual fluctuation of things, the antiquity and duration of the extended scenes of existence,—is the object of the succeeding disquisition. Its intention will however be still

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more essentially answered, if, while obviating the erroneous conclusions which too universally prevail, in respect to the antiquity of furrounding objects, it gives a new and clearer insight into the nature of existence.

We have sought for truth,—not in the opinions of mankind, but in every step have been guided by plain sense and simple matter of fact. Nor can there exist a doubt, that, by thus giving a scope to cool and liberal investigation, the interests of the human species have been essen-

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tially consulted. To what purpose can it be, that the errors of dark ages should cramp the reasonings of men, who live in a time when every thing is so much reversed? Truth never injures mankind. Ignorance, obscurity, and superstition alone engender the mischiefs which disturb society. In this enquiry we have then attempted to trace, not from reasonings purely metaphysical, but from the most undoubted facts, the remote existence of animal and vegetable life, and of the world itself. How far such intention has been answered,

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answered, is left to the reader's determination.

Here it must however be confessed, that, independent of the considerations already enumerated, the Author has in view other objects, nearly connected with the design of this performance. The baneful and gloomy influence of Gothic barbarism and superstition upon the understandings and the morals of mankind, have been perhaps too sparingly touched upon. The disagreeable effects of mistaken zeal and opinions, indeed, can

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scarcely be placed in too striking a point of view. In short, the manners of society have been, and are still, most materially injured by circumstances, which the outcry of folly would deem essential to the existence of society itself.

Happy then shall he esteem himself, if the few succeeding Observations have but a tendency to shake the fixed prejudices of his fellow-creatures; to assuage the remaining turbulence of ignorance and error; and thus to smooth

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smooth the way to that refinement, which essentially contributes to the peace, safety, and welfare of the human species.

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ment which essentially consti-
tutes to the peace, stability and
wellfare of the human species.

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It is the duty of the philosopher to
investigate the principles of the
human mind, and to determine
the extent of its powers. It is
his duty to ascertain the nature
of the ideas which are con-
tained in the human mind, and
to determine the manner in which
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OF THE
WORLD.

SECTION

The First.

THE traditions concerning an original formation of things have ever been connected with the various opinions of mankind. Nor exists there any people without some
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confused ideas as to the circumstances of the world, and Nature's first existence.

Thrown into the mysterious scenes of life, passing themselves, through the state of infancy, to the different stages of their being; it became natural for mankind to dive into the boundless ocean of antiquity, in search of the infancy of worlds. Unequal however to the task of reasoning pertinently, on a matter of such intricate investigation, they heedlessly adopt the reigning principles. Unfortunately, the oral traditions of the unpolished and the written tracts of the civilized parts of the human species, in these particulars, have an equal pretension to refinement.

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finement. Descending to the minutest circumstances, the sages of various countries fix with certainty the epoch of the extraordinary birth; and in doing this, they diametrically contradict one another.

With gravity can they tell us the place where Nature took first her origin; intimately are they acquainted with the actors in the scene,—they know the duration, the little incidents of their lives,—they draw from circumstances of their conduct the most important conclusions,—and they trace their own lineal descent from their first imaginary parents. In short, these events are fixed, either in the traditions or the written histories of

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their respective countries, with a chronological precision.

Nor is it to be wondered at, if the strangest inconsistencies occur in all these narrations. Fabricated in the rude infancy of society, they contradict, in an uncommon degree, the plainest and most simple truths of nature. And the sensible inquirer, from a thousand sources, is sufficiently convinced of the little dependence, which ought to be placed upon rude, contradictory assertions.

The vague stories, then, of nations concerning the origin of worlds, should be ranked but among the grossest errors of mankind. They only
serve

serve to shew us the operations of the human mind in a barbarous age, the superstitious folly that predominated. How disagreeable then would be the task of a tedious comment, upon the dreams and superstitions of illiterate barbarians!

Content, in the course of the succeeding observations, to place the matter in its just point of view, I decline the unnecessary task of canvassing the particulars of ridiculous opinions, however universally received.

Here let me observe, that this is done out of a principle widely different from that which actuates the mass of writers. Staggered with the

idea of contradicting notions so generally adopted, and which long have been disguised under the mask of an elevated authority; possessed of some gothic and prevailing ideas, that the essential security for virtue and good morals is universal ignorance and superstition! perhaps influenced not a little by the dread of the censures of the prejudiced part of mankind, whose very censure and disapprobation, if they reflect any thing, reflect distinguished lustre; in short, to avoid imaginary stains upon their character, men, otherwise sensible, and even liberal in their sentiments, upon these occasions, give to the errors of delusion too ready an assent. They suffer themselves to be carried away, at the
expence

expendence of reason and sound judgment, by the torrent of hereditary folly, and the vulgar prejudices.

But the case is very different with the real philosopher. Regardless of the voice of falsehood and of folly, he listens with rapture to that of nature and of truth, under whatever circumstances they may be concealed. He is well convinced, that men are invariably virtuous, in proportion as they have clear perceptions of things ; That the true principles of morals neither can be practised, enforced, nor understood, in an age of barbarism and superstition ; That the human species, in such ineligible circumstances, mistake the real objects of happiness or

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virtue; and, so far from protecting or enlivening the moment of existence, precipitate themselves into gloomy melancholy or headlong destruction. In short, he is most fully satisfied, that nothing can be either beautiful or estimable, which has not for its basis the solid foundations of nature and of truth,

and of truth, under whatever circumstances they may be concealed. He is well convinced, that men are invariably virtuous, in proportion as they have clear perceptions of things; That the true principles of morals neither can be practised, enforced, nor understood, in an age of barbarism and superstition; That the human species, in such ineligible circumstances, will take the real objects of happiness or virtue;

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The Second.

THUS have I industriously avoided commenting minutely upon the opinions of this or that country, in respect to an original formation of things; and in doing this, have deviated from a prevailing custom. To investigate a subject in the simple tract of reason and of nature, has scarcely been esteemed sufficient. Solicitous formally to confute the doctrines of others, which might seem to clash with their own, writers have too often sacrificed the perspicuity

perspicuity of their subject to tedious and uninteresting controversy.

Mankind indeed, when once possessed of notions, though of the most absurd nature, are apt to think themselves injured and neglected, by passing in silence their respective opinions. But I think it will be readily granted me, that some opinions are best treated with contempt.

When men obviously forsake the simplest truths of nature, when they become bigottedly attached to a favourite system, or to some reigning superstition, what arguments can counteract their obstinacy! what energy of truth

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truth or reason enforce conviction !
To point out their absurdities, but rivets them in their errors ; seriously to confute them, is a fruitless labour.

The antiquity of the world, of animated nature, and the extended scenes of existence, I shall, then, without further ceremony, endeavour to investigate,

From the obscure lights of human tradition,—and

From an attentive examination of the various productions, which nature has presented to our inspection.

In

In this division of our subject into distinct heads, it seems necessary to direct our first attention to the fleeting traditions, the testimony of the human species. Let us then inquire into the manner of receiving such testimony, or such traditions, from distant ages.

The arts of all others unquestionably the most important, those of registering ideas through the medium of literary characters, and thus conveying interesting facts to posterity, would seem, from limited observations, to have had their origin in the East. Yet the reasonings throughout this inquiry will make us hesitate in determining, whether this has really been the

the case. At all events, it must evidently appear to a person, who has been accustomed to examine into human nature, with an attentive and penetrating eye, that these valuable acquisitions could not at any time, in any country, nor among any collection of individuals, have possibly been attained 'till after a long series of civilized exertions. And when such civilization once is attained, to what unspeakable fluctuations is it subject! Many ages are men knit together in society, before considerable improvements of any sort take place; but 'ere the refinement of registering ideas, perhaps an essential cause of man's superiority in the scale of nature, can ever be supposed to have had existence, the arts of social

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life

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life must have been eminently advanced.

In proof of this, the Mexicans, who had gone some considerable length in many of the arts of polished society, had yet made no farther progress in the art of writing, than that of delineating, with various coloured feathers, the objects which they wished to represent.

What then can we possibly expect to know, with any certainty, of history or antiquity 'ere this epoch ! Knowledge derived from written observations, by the intelligent man, is received with the utmost diffidence and caution. But the accounts of things
3 which

which flow from a distant tradition are well known to be the most glaringly absurd, and to bring scarce a glimmering of truth to remote descendants.

Here then, evidently, is seen the impossibility of coming at any essential knowledge of the matter in question, from the source of human tradition!

But, independent of that absolute necessity of an extended civilization, to give even the minutest origin to the art of writing or registering of ideas, a little knowledge of the world is sufficient to convince us, that human society has been, and is still, in
a con-

a continued revolution. Empires rise and fall, barbarism and civilization, knowledge and superstition, riches and poverty, alternately succeed each other. Is it possible then for us, from a limited experience, to fix with assurance, what events have happened, may or may not be expected? Can we, amid daily revolutions, look backwards or forwards for but a few millions of years, and fix with the shadow of probability the state of arts and sciences, or of human society, at such periods? And what, let me ask, are millions of years, compared with the endless periods of eternal duration? The literary advances of the present day may fade, from incidents totally unforeseen. Our boasted civilization,

at

at some future period, may no longer exist. It is well known that the learning of the Greeks and Romans was in danger of entirely perishing, by the inundations of barbarous nations. Fortunately, however, some few monuments of their literary accomplishments have been preserved to us. Yet had these convulsions continued a little longer, had they but been a little more violent, should we have known what had passed among those celebrated nations, even a few centuries before us, and in the vicinity of our native country? The Romans and the Greeks were but of yesterday, and we, by the merest accident in the world, know a few of their transactions!

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That the mechanical arts depend essentially upon the state of literary refinement, will be readily granted. Could a people then be deprived of the latter without a considerable decay of the former? Yet when slight circumstances of improvement accidentally spring up among a barbarous people, it is natural for fable and tradition to ascribe to them a much later origin than the true one.

Such then are the slippery foundations for the inconsistent arguments of those, who, turning their attention to the momentary transactions of Greece and Rome, lose sight of the transactions of every surrounding nation, and of the

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the uniform and undeviating operations of nature!

Were I, however, in the least disposed to pay any sort of deference to the dreams of furrounding nations, or to lay a stress upon reasonings drawn from the testimony of the ignorant part of mankind; did I even so much as expect to meet with any thing in the smallest degree satisfactory, as to the antiquity of the world, the human species, or an extended succession of events, from such a channel, which nation, let me ask, of those at present existing, out of the vast assemblage, has the greatest claim to so distinguished an attention?

How insuperable the difficulty even to answer this simple question, or to fix upon the society of men, whose written observations have survived the wreck of time, or whose records are of the highest antiquity! Nor indeed is it at all essential to our purpose that we should do so. The dispute, could it be absolutely determined, has not the smallest reference to the object of our inquiry, the real antiquity of the human species. It never can be other than matter of curiosity; and that curiosity could only point out to us a collection of individuals, who had an early pretension to extended refinement. Antecedent to them, other nations might, however, still have existed, whose civilization, and whose literature,

literature, had been absorbed, or swallowed up, in the convulsions and revolutions of the world,

The pyramids of Egypt, and the written mountains of Arabia, were monuments of once an enlightened people ; yet neither do we fully understand the inscriptions upon the former, nor the hieroglyphics upon the latter. In all probability, these may have a still juster claim to antiquity, than any written books or records that are extant. But how strongly must the futility of having recourse, on the subject of real antiquity, to the records of mankind appear, since (as it will be the business of this inquiry to demonstrate) the very materials of the pyramids,

mids, the written rocks themselves, and even the mountains upon which such engravings are visible, have each of them been as regularly and progressively formed as were the engravers!—

Then what are we to think of those Europeans with whom modern annals have made us acquainted? How limited have been their knowledge and understandings! How inexpressibly absurd the barbarous impressions that they have received! In short, trivial circumstances alone have turned their eyes and undistinguishing credulity to channels, from whence nothing satisfactory can possibly be derived.

The

The Chinese, who have long been established in a beautiful and regular society, have records of that ancient date, which ought to have staggered such prevailing and such ill-grounded pretensions. Many of these, indeed, would appear to extend (as it has been repeatedly suggested) to an antiquity altogether unfathomable.

Yet though the Chinese may seem to have the most undisputed claim to this remote refinement, recent observations, and those of a nature the most truly authentic, have strongly attracted distinguished and merited attention to other Eastern nations. Writers of credit and distinction, whose particular situations in the East Indies gave them

access to such intelligence, had long opened to us the unquestionable antiquity of the people of that country. Circumstances have, however, recently transpired, which hold out lights still more interesting.

The translation of the Gentoo * laws evidently carries so curious a subject to what some would be disposed to call a singular extent. Yet such limited antiquity can never surprise any but those who, from the general nature of things, have not previously been prepared to look for some such incident.

The judicious translator of these interesting tracts, struck with the scenes

* By Mr. Halhed.

in

in which he had been long and intimately conversant, in his preliminary treatise has made some pertinent observations.

‘ The Hindoos, as well as the Chinese,’ says he, ‘ have ever laid claim to an antiquity infinitely more remote than is authorised by the belief of the rest of mankind. It is certain, however, that these two nations have been acquainted with letters from a very early period, and that their annals have never been disturbed or destroyed by any known revolution. And though we may come to the perusal of their records armed with every argument, and fortified even to prejudice against the admission

' admission of their pretensions, and
 ' at the same time placing the most
 ' implicit reliance upon the chrono-
 ' logy as generally received; yet their
 ' plausible accounts of those remote
 ' ages, and their undeviating confi-
 ' dence in their own assertions, never
 ' can fail to make some impression,
 ' and that in proportion as we gain
 ' a clearer insight.

' Suspicions of a like nature are not
 ' totally without foundation, even in
 ' the Western world; and the con-
 ' scientious scruples of the historio-
 ' grapher of Mount Ætna (as men-
 ' tioned in a late publication *) will

• Brydone's Tour.

' always

‘ always be of some weight in the
‘ scale of philosophy.’

Like the rest of mankind, the Gen-
toos, too, have rude sketches of a
creation. Their fabulous and extra-
vagant narrative obtains among them
the most implicit credit, notwithstand-
ing it is evidently replete with glaring
absurdities.

Though already I have expressed a
fixed determination of avoiding a for-
mal comment upon such vague and
ridiculous opinions, yet a simple nar-
rative of the notions of these people
may serve as a parallel to the notions
of others. And indeed, of all the
absurd and imaginary systems with
which

which we are acquainted, in respect to this subject, it carries with it full as much the face of probability.

According to their notions, after the earth and the heavens were formed, a creature was produced called Burmha. It was this most extraordinary personage that manufactured mankind, together with the innumerable beasts, birds, vegetables, &c.

The inhabitants of India, however, aspire to a much more elevated station in the scale of existence than other nations, whom they style the reprobate part of the human species. The most distinguished of their tribes came from the mouth and from the arms of Burmha; the
I rest

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rest were the offspring of his thighs and of his feet!

Thus then are they positive, and as clear as we, in the existence of things which in fact never had existence!

These people reckon the duration of the world by four distinct periods. They admit in the calculation of its age seven millions two hundred and five thousand years!

It is needless to say, that conjecture must unavoidably have taken place in this enumeration; yet we cannot here sufficiently admire the sagacity of men, who, in a point the most truly interesting,

teresting, approach something nearer to nature and sublimity, than the vain and superstitious inhabitants of the Western hemisphere.

‘Rajah Prickutt,’ continues our author, ‘who, though ranked as a modern in the records of India, is yet known to have lived upwards of four thousand years ago, was no less anxious than modern philosophers are, to pierce through the obscurity of time, and to trace the progress of the world from its infancy. At his instigation, a work was composed by a learned Bramin, containing the history of India through the preceding periods, with the succession of the several Rajahs, and
‘ the

‘ the duration of their reigns. This
 ‘ curious history still subsists, divided
 ‘ into twelve books and three thou-
 ‘ sand and twenty chapters.’

How singular then must all this ap-
 pear to men whose ideas are cramped
 by the fetters of superstition ! who
 have been taught from their infancy
 to believe, that Nature is but in the
 very dawn of her existence ; and that
 a few thousand years are the utmost
 extent of her duration : in short, who,
 incapable of taking any extended views
 whatever, dream but of those un-
 meaning incidents that have momen-
 tarily preceded their own. No sooner,
 indeed, are they informed, that an his-
 tory still exists composed four thousand

years ago, and that traces mankind upwards through millions of years, than instantly they revolt at the idea; and, placing a confidence in the dreams of their ignorant predecessors, are insensible to the voice of reason, and to the simplest operations of nature. A very small portion of reason and reflection, one might have thought, should have convinced mankind, that millions of years are but as moments in duration; that the events that are daily obvious, are but the ordinary incidents that ever have happened, and ever will happen. Yet still is it echoed by the barbarous nations that triumphed over the more refined civilization of Greece and Rome, that Nature lasts but for a time, and that she

she has had but a beginning, as it were of yesterday. Indeed so clear are they about these fundamental points, that they are perfectly well acquainted even with the very years and days of her origin, and prophetically do they dream about the dissolution of the existence of nature!

How gladly then would an ignorant and superstitious part of the human species, impose upon the understandings of the rest!—How strenuous their exertions to degrade, to debase mankind! Fain would they persuade us, that Nature is but of some thousand years duration; that the only human actors in existence have been a few surrounding nations,

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a part

a part of them triflingly civilized, and others totally absorbed in the grossest ignorance and barbarism; some indeed possessed of undigested records, others altogether devoid of them; and all of whose records, actions, and ideas, have but recently dawned upon their own.

Can then such reasoners possibly be said to have any pretension to right reason? How blind to the nature of their own existence! How totally deprived of any sort of notion, either as to their relative situation in life, or the eternal revolutions of beings and events!

SECTION

The Third.

HOWEVER high the European, the Egyptian, the Indian, the Chinese, the Asiatic, or in short any existing records may seem to extend, when compared with notions which generally prevail, in spite of every thing that is reasonable or consistent; yet I flatter myself the unprejudiced enquirer will have been sufficiently convinced, both from what has already been said, and from his own observations, That human testimony

or tradition, even granting them their utmost latitude, are but of the most limited extent; that it is only in the advanced state of refinement, that the art of writing could, at any time, or in any country, possibly have taken its origin; and that this valuable acquisition, important as it is, is subject to the most unspeakable fluctuations.

In short, it does but in a temporary and imperfect manner preserve the fleeting actions of mankind, and make them, as it were, for a moment survive themselves. The innumerable ages of barbarism, and ignorance; the multiplied successions of the unrecorded part of the human species,

species, emerge not from their oblivion. No more traces of their existence remain to us, than if they had never existed. Themselves, the place, the time, the circumstances of their passage, are for ever lost to the reasonings, and to the contemplation of mankind.

Important and decisive as such trains of reasoning certainly are, they seem not, as I can recollect, to have been sufficiently attended to. From them however may be inferred, and without the smallest hazard of plausible contradiction, circumstances of the most truly philosophical nature: In short, independent of every other con-
D 3 deration,

deration, what distinguished light do they not throw upon the real antiquity of the world, and of the human race ! For, though beyond momentary periods every thing lies hid in undistinguished darkness, yet is there room for reason's operation. She announces, without the shadow of hesitation, That the human species, and the other branches of animated nature, fluctuating in their increase and decrease, their barbarism and refinement, actually may have flourished, amid the unceasing revolutions of nature, through endless periods of existence,

SECTION

The Fourth.

HAVING sufficiently shewn the extreme folly of expecting any thing in the least to our purpose, from all that has been written by those, who have inconsistently been called the ancient part of mankind, either as to the circumstances of their own, or the world's first existence; and having demonstrated the very limited extent of human tradition, allowing it even its utmost latitude; I come to the second, and indeed the important part of our enquiry: the lights

that may be received from an attentive examination of surrounding objects.

But, in every part of that branch of natural knowledge, which our enquiry obliges us to have recourse to, we cannot without astonishment reflect, that the most important truths seem never to have been sufficiently known or illustrated. Moderns alone, and those our immediate predecessors and contemporaries, have indeed possessed themselves of facts of an interesting nature; though perhaps nothing can be possibly conceived more vague and undecisive, than the little use that they have made of them.

The

The vestiges, for instance, of the animals and vegetables, both of the land and sea, have been met with within the contexture of every species of stone, and other matter, constituting the various countries of the world. Yet what just conclusions have we been able to draw from such singular appearances? What have the more enlightened done, from whom more might have been expected, but gazed with wonder and admiration, and confessed themselves bewildered in a labyrinth of doubt and uncertainty? In short, the clear and simple inferences that might have been deduced, have been lost amid the dreams of system and of superstition.

‘ In

‘ In the Isle of Caldey, and elsewhere, about Tenby in Pembroke-shire, the fishes of the sea have been found in solid marble, on the face of the broken sea-cliffs, four hundred yards below the upper surface of the rocks. Nor were they only observed on the face of these rocks; but even more or less throughout the whole mass or extent of them.

‘ This is manifest from divers parts of the rocks, which have been hewn down by workmen, for making lime, and from other pieces casually fallen from the cliffs *.’

* Ray.

In

In stone too of a totally different nature from marble or limestone, the vegetable impressions, and the remains of land animals are every where obvious. And, what is equally singular, coal no where, and iron probably never occurs, but in the beds of matter, that are thus impressed with such land animals and vegetables. In short, ' since it appears evident, that all the beds of ' stone and clay, accompanying coal, ' universally abound with vegetable ' forms, it seems to indicate, that ' coals were originally derived from ' the vegetables thus enveloped in the ' stone or clay; and we may say as ' much of the origin of iron, for the ' same

'same beds invariably produce iron
'stone*.'

How universal then is the existence
of such curious occurrences ! How
decisive and important the philosophy
that they suggest ! The appearance
of animal impressions, within the con-
texture of every species of stone, de-
monstratively indicates the progressive
formation, not only of stone in gene-
ral, but of the various countries of
the world. It is unnecessary to com-
ment any farther, in this place, upon
the preceding facts ; it is the object
of the succeeding observations, to
give an adequate sketch of the im-

* Whitehurst.

portant

portant operations of nature, and of the eternal fluctuation of things.

It is necessary however to premise, that, to speculative minds natural facts, in variety of instances, have ever suggested their antiquity. Yet, whether from the limited extent of natural observations, or from that diffidence which ingenious men sometimes find in entertaining ideas subversive of the general opinions; most certain it is, that the very facts that suggested such antiquity seem to have been but little understood, either as to the philosophy they unavoidably confirmed, or that equally interesting succession of time, which cool disquisition might have brought them to support.

Out of the variety of facts that thus convey more extended reasonings than would at first appear, let us mention those, which were some time ago candidly offered to the world by an author of credit*. Such facts, however curious in themselves, will ever be found but of limited and insignificant antiquity. Yet when taken in a philosophical point of view, when brought in support of reasonings of an extended and interesting nature, they most undoubtedly become of the very first importance; and even throw the strongest light, both upon natural knowledge and upon the whole system of things.

• Brydone's Tour.

Speaking

Speaking of the lava of Mount Ætna, it is observed, ‘ That the surface of that black and barren matter, ‘ in process of time, becomes the most ‘ fertile earth imaginable. But that ‘ the period required to bring it to its ‘ utmost perfection may be judged of, ‘ when a district of vast extent is yet ‘ covered with a very scanty soil, ‘ though mentioned by Diodorus Siculus, and the ancient Sicilian writers, to have burst from Ætna in the ‘ time of the second Punic war, when ‘ Syracuse was besieged by the Romans. This is a space of two thousand years ; and, in all probability, ‘ it will require some hundred years ‘ yet, before the earth is rich enough ‘ to render it of any use to the proprietors.

‘ prietors. But what shall we say to
‘ a pit sunk near Jaci of a great
‘ depth? They pierced through seven
‘ distinct lavas, one over the other,
‘ the surfaces of which were parallel,
‘ and most of them covered with a
‘ thick bed of fine rich earth. The
‘ eruption which formed the lowest of
‘ these, if we may be allowed to rea-
‘ son from analogy, must have flowed
‘ from the mountain at least fourteen
‘ thousand years ago.’

The same author ingeniously ob-
serves, ‘ That the progress and form-
‘ ation of this fertile soil is possibly as
‘ follows: The lava, being a very
‘ porous substance, easily catches the
‘ dust that is carried about by the
‘ wind,

‘ wind, which at first only yields a
 ‘ kind of moss; this rotting, and by
 ‘ degrees increasing the soil, some
 ‘ small meagre vegetables are next
 ‘ produced, which, rotting in their
 ‘ turn, are likewise converted into
 ‘ soil.’

What is the proportion of a few thousand years, compared with the endless periods of eternal existence,—the unbounded revolution of events,—that vast succession of time and of incidents, which it is the object of this enquiry to illustrate?

Independent then of the trifling consideration of so limited a period, we have in the present instance a cu-

E

rious

tious specimen of the gradual production of a vegetable soil or earth. It matters not whether nature is directly uniform in the time or in the mode of producing such a soil. We have at present only calmly to contemplate the quantity of similar earth that is met with in the world. It will hereafter be demonstrated, that nature, as she was progressive in the production of an earth at *Ætna*, and in similar districts, so is she progressive in the production of every species of substance and earth existing. Impressed with such ideas, how strikingly must we see the true importance of such natural facts, their singular reference both to philosophy and antiquity!

Taken

Taken in any other point of view, the preceding observations at *Ætna* only prove, and that in a very limited degree, the antiquity of a single mountain; that mountain, as well as its eruptions, the effect of uniform operations, — the gradual product of time and of natural causes, and but a mere firework compared with the burning mountains of the Andes.

M. Condamine seems to have been the first naturalist who entered into a pertinent discussion of the subject of volcanos. Among other ingenious observations, he tells us; ' That it is impossible for any one ' who has attentively examined the ' productions of *Vesuvius*, not to

' be satisfied of a perfect resemblance
 ' between them and those he will
 ' meet with at every step in his way
 ' from Naples to Rome, from Rome
 ' to Viterbo, from Rome to Lo-
 ' retto, &c.

' It then necessarily follows, that
 ' all this part of Italy has been ruined
 ' by volcanos. Those plains now so
 ' smiling and fertile in olive trees,
 ' mulberry trees, and vines, like the
 ' hills at present about Vesuvius, have
 ' like them been overspread with
 ' burning inundations, and bear as
 ' they do, not only within but on
 ' their surface, infallible marks of
 ' fiery torrents whose waves are now
 ' fixed and consolidated.

‘ When I see, continues he, on
 ‘ an elevated plane, a circular basin
 ‘ surrounded with calcined rocks;
 ‘ the verdure with which the neigh-
 ‘ bouring fields are covered imposes
 ‘ not upon me; I instantly perceive
 ‘ the ruins of an ancient volcano.

‘ In short, I look upon the Ap-
 ‘ pennines as a chain of volcanos,
 ‘ like that of the Cordeliers of Peru
 ‘ and Chili, which run from North
 ‘ to South the whole length of
 ‘ South America,

‘ It is not therefore in Italy alone
 ‘ that the vestiges of calcination and
 ‘ vitrification are to be met with;

‘but also in places where volcanos
‘have never been supposed to have
‘existed.’

It has since however become a fact well known to naturalists, that calcined rocks, pumice stone, and lava, the undoubted vestiges of volcanos, have every where presented. In short, innumerable are the specimens of the remote existence of extinguished eruptions, as well in this island as in France, Germany, North America, the West Indies, the late discovered Islands in the South Seas, and in every district of the world,

If

If it is not criminal, then, in these days of ignorance as to such matters, to speak in the language of reason and philosophy, volcanos in any particular district are but of momentary existence. The fleeting children of Nature, they have their rise, their progress, their extinction. Their influence is important, their remains are almost every where visible, their existence perhaps universal.

In the inexplicable lapse and in the advance of time, to the ignorant and to the wondering world, their issuing flames ever have been, and ever will continue to be, matter of surprise!

Sir William Hamilton, in his Observations on Mount Vesuvius, has mentioned facts of a nature very similar to those already suggested. As some of these, however, carry with them the stamp of antiquity, impress us with some curious ideas as to the singular influence of volcanos, and, what is still of far greater consequence and nearer to the purpose, afford us a specimen of the progression of nature in the formation of her productions, and thus still better prepare us for the extended views that are to be taken, they are by no means unworthy our attention,

It

‘ It would require,’ says Sir William; ‘ many years close application
 ‘ to give a proper and truly philo-
 ‘ sophical account of the volcanos
 ‘ in the neighbourhood of Naples;
 ‘ but I am sure such an history
 ‘ might be given, supported by de-
 ‘ monstration, as would destroy
 ‘ every system hitherto upon the
 ‘ subject. We have an opportunity
 ‘ of seeing volcanos in all their dif-
 ‘ ferent states. I have been this
 ‘ summer in the island Ischia; it is
 ‘ about eighteen miles round, and
 ‘ its whole base is lava. The great
 ‘ mountain in it, near as high as
 ‘ Vesuvius, I am convinced was
 ‘ thrown up by degrees.’

‘ A ce-

'A celebrated physician,' continues he, in another part of his work, 'now living at Naples, in the introduction of his account of the eruption of Vesuvius, has observed, that near a convent of Dominican Friars some years ago, in sinking a well, at the depth of a hundred feet a lava was discovered, and soon after that another, so that in less than the depth of three hundred feet, the lavas of four eruptions were found. From the situation of this convent it is clear beyond a doubt, that the lavas proceeded from the mountain called Somma, as they are quite out of the reach of any existing volcano.

' From

‘ From these circumstances,’ says Sir William, ‘ and from repeated observations I have made in the neighbourhood of Vesuvius, I am sure that no virgin earth is to be found; and that all is composed of different beds of erupted matter, even to a great depth below the level of the sea.’

Independent then of every prospect that volcanos thus long ago extinguished must unavoidably present, we have here once more a curious specimen of that truly pertinent and interesting train of reasoning, which alternate layers of vegetable earth gradually formed out of substances of a nature totally different,

different, or that islands, mountains, or countries of lava covered with vast beds of such vegetable soil, unavoidably suggest. Another curious scene presented from the preceding facts, and which ought not to escape us, is the present position of the sea; that element evidently does occupy a widely different situation in respect to this continent, from what it did in remote antiquity.

SECTION

The Fifth.

AS some very interesting changes are most undoubtedly effected by the eruptions of volcanos; as the effects they produce upon the globe itself, will hereafter be brought to support other observations in the succeeding part of this enquiry; as such natural facts are even in themselves abundantly entertaining; and as it is essentially necessary that we should be impressed with an adequate idea of their general and important

portant influence; it may not be amiss to mention some few circumstances, selected from the multitude of those that have been recorded by authors both antient and modern.

‘ In sixteen hundred and sixty-
 ‘ nine, after a dreadful eruption of
 ‘ Ætna, and while the fact was re-
 ‘ cent, Alphonfus Borellus, a learned
 ‘ mathematician of Pisa, went into
 ‘ Sicily to survey what Ætna had
 ‘ done; and he says, the quantity
 ‘ of matter thrown out at that time,
 ‘ upon survey amounted to ninety-three
 ‘ million eight hundred and thirty
 ‘ thousand seven hundred and fifty
 ‘ cubical paces; so that had it been
 ‘ extended in length upon the sur-
 ‘ face

' face of the earth, it would have
 ' reached farther than ninety-three
 ' million of such paces; which is
 ' more than four times the circuit
 ' of the whole earth, taking a thou-
 ' sand paces to a mile: 'tis true
 ' that all this matter was not liquid
 ' fire, but in part sand, stone, gra-
 ' vel, &c. However, he computes
 ' sixty-three hundred thousand paces
 ' of this matter were liquid fire,
 ' and formed a river sometimes two
 ' miles broad, according to his com-
 ' putation; but according to the ob-
 ' servation of others, who also view-
 ' ed it, the torrent of fire was fix
 ' or seven miles broad, and some-
 ' times twenty or thirty yards deep;
 ' and it forced its way into the sea
 ' near

‘ near one mile, preserving itself
 ‘ alive in the midst of the waters.
 He likewise observes, that ‘ a stone
 ‘ fifteen feet long was flung out of
 ‘ the mouth of the pit to a mile
 ‘ distance; and when it fell, it came
 ‘ from such an height and with
 ‘ such violence, that it buried it-
 ‘ self in the ground eight feet
 ‘ deep*.’

However astonishing the matter
 thrown out by the above eruption
 may appear, a still greater quantity
 seems to have been discharged from
 a volcano in Peru: ‘ In the year six-
 ‘ teen hundred a shower of ashes,
 ‘ sand, &c. covered all the land

• Burnet.

‘ thirty

‘ thirty leagues one way, and forty
 ‘ leagues another round about Arc-
 ‘ quepa, from six feet to eight or
 ‘ nine inches deep*.

‘ In the year sixteen hundred and
 ‘ twenty-eight, one of the islands of
 ‘ the Azores, near the Island St.
 ‘ Michael, rose up from the bottom
 ‘ of the sea, which in that place
 ‘ was three hundred and twenty
 ‘ yards deep; and this island, which
 ‘ was raised in fifteen days, is nine
 ‘ miles long, four miles and a half
 ‘ in breadth, and rises three hun-
 ‘ dred and sixty feet above the
 ‘ water†.

* Dr. Hooke's Posth. And see these and a variety of similar facts collected by Whitehurst.

† Sir William Hamilton.

On the twentieth of November
seventeen hundred and twenty, a
subterraneous fire burst out of the sea
near Tercera, one of the Azores,
which threw up such a vast quan-
tity of stones, &c. in the space of
thirty days, as formed an island
about six miles in diameter and
nearly round. Prodigious quan-
tities of pumice-stone and half-
broiled fish were found floating on
the sea, for many leagues round the
island*.

Another example of the same
kind happened at Manilla, one of
the Philippine Islands, in the year
seventeen hundred and fifty. This

Philosophical Transactions.

eruption

‘ eruption was attended with vio-
 ‘ lent earthquakes, to which that
 ‘ island, as well as the rest of the
 ‘ Philippines, is very much subject*.

‘ In the year sixteen hundred
 ‘ and thirty-one a stone was thrown
 ‘ twelve miles from the crater of
 ‘ Vesuvius, and fell upon the Mar-
 ‘ quis of Lauro’s house, which it set
 ‘ on fire†.

‘ The eruptions of Vesuvius, in
 ‘ the year seventy nine, overwhelm-
 ‘ ed the two famous cities of Her-
 ‘ culaneum and Pompeii by a shower

* Rev. Mr. Michell’s Observations on Earth-
 quakes.

† Sir William Hamilton.

68. THE ANTIQUITY AND

‘ of stones, cinders, ashes, sand, &c.’
 ‘ and totally covered them many’
 ‘ feet deep, as the people were sit-’
 ‘ ting at the theatre. Herculaneum’
 ‘ is said to have been situate about’
 ‘ four miles from the crater, and’
 ‘ Pompeii at the distance of six’
 ‘ miles: yet the latter appears to’
 ‘ have been covered by that dread-’
 ‘ ful eruption ten or fifteen feet deep ;’
 ‘ and the former, by that and sub-’
 ‘ sequent eruptions, lies buried sixty’
 ‘ or seventy feet deep *.’

Such are then the singular and
 such the extended influences of vol-
 canos! Yet however interesting such
 speculations are, or whatever lights

* Burnet's Sacred History.

they

they may seem to throw upon the subject of natural knowledge or antiquity, I shall soon proceed to offer facts, which, from the reasonings they unavoidably suggest, will be found to be of still higher importance.

Let us, however, premise some few circumstances, ere we enter into the real and serious discussion of the subject of this enquiry. The facts which I shall mention, on this occasion, are but of a secondary nature; and indeed the scenes are situated upon the surface of countries, which countries themselves, it will be clearly demonstrated, were as regularly formed, and are subject to as gradual decay, as any man, vegetable

or animal that ever had existence. I would then wish it to be understood, that I have been induced to give these simple facts a place in this enquiry, as simplicity will ever be found the best introduction to every species of speculation; and as some appearances occur, whose importance and general truth will be hereafter unavoidably confirmed.

‘ At the mouth of the River
 ‘ Nefs, near Bruges in Flanders, fifty
 ‘ feet below the surface of the earth,
 ‘ are found great quantities of trees,
 ‘ lying as close to each other as
 ‘ they do in a wood; the trunks,
 ‘ the branches, and the leaves, are
 ‘ in such perfect preservation, that
 ‘ the

‘ the particular kind of each tree
 ‘ may instantly be distinguished.
 ‘ About five hundred years ago, this
 ‘ very ground was known to have
 ‘ been covered with the sea; nor is
 ‘ there any history or tradition of
 ‘ its having been dry ground, which
 ‘ we cannot have the smallest doubt
 ‘ must have been the case*.

‘ At the city too of Modena, and
 ‘ about four miles round it, where-
 ‘ ever it is dug, when the workmen
 ‘ arrive at the depth of sixty-three
 ‘ feet, they come to a bed of chalk,
 ‘ which they bore with the augre
 ‘ five feet deep. They then with-
 ‘ draw from the pit before the au-

* Vid. Hist. Naturelle par Buffon.

‘ gre is removed; and upon its ex-
‘ traction, the water bursts up
‘ through the aperture with great
‘ force and violence, and quickly
‘ fills this new made well, which
‘ continues full, and is affected nei-
‘ ther by rains nor droughts. But
‘ that which is remarkable in this
‘ operation is, the layers of earth
‘ as we descend. At the depth of
‘ fourteen feet are found the ruins
‘ of an ancient city, paved streets,
‘ houses, floors, and different pieces
‘ of mosaic. Under this is found
‘ a solid earth that would induce
‘ one to think had never been re-
‘ moved; however, under it is found
‘ a soft oozy earth, made up of
‘ vegetables; and twenty-six feet
‘ below

' below the surface, large trees en-
 ' tire, such as walnut-trees with the
 ' walnuts still sticking on the stem,
 ' and their leaves and branches in
 ' exact preservation. At the depth of
 ' twenty-eight feet a soft chalk is
 ' found, mixed with a vast quan-
 ' tity of shells, and this bed is
 ' eleven feet thick. Under this, ve-
 ' getables are found again with leaves
 ' and branches as before; and thus
 ' alternately, chalk and vegetable earth
 ' to the depth of sixty-three feet.
 ' These are the layers wherever the
 ' workmen attempt to bore; while
 ' in many of them they find bones,
 ' pieces of iron, and bits of charcoal*.'

* See Goldsmith's History of the Earth, and
 see also the same facts described by Ray and Buffon.

These familiar descriptions scarce need any comment. The narratives themselves sufficiently rouse the imagination, and human curiosity is excited by the curious prospects, which such facts unavoidably suggest. A few observations I must however venture to make.

We see then, in the first of these instances*, a country covered with the sea, but a few centuries ago, and which had once afforded all the beauties of a landscape; had even been the seat of large forests. So strange a revolution appears, however, to have been an operation of nature by no means irregular. The sea, after retaining its place for some consider-

* Page 70.

able time, and forming a prodigious depth of water, as is evident from the land buried deep beneath its productions, once more gradually forsakes its station; and the vestiges of its dominion hasten, as it were, to hide themselves from the eyes of the superficial observer. The spot puts on a new face; it becomes the seat of a luxuriant vegetation, fitted once more for animal existence, and prepared, in the flow and unerring progress of time, for a repeated exhibition of scenes, which to limited observation appear astonishing and uncommon,

In the instance, however, at Modena, is presented a very different prospect,

prospect. A district in the middle of Italy, age after age, would seem to have been alternately overwhelmed and deserted by the sea; one revolution following another in a multiplied succession. And, though such overflowings must have continued but for a short duration; yet, in each instance, variety of substances were slowly and successively formed. In short, the production of vegetable soils, similar to those of *Ætna*, is strikingly conspicuous; as well as a sketch of nature's regular progression, in the formation of beds of chalk, shells, and other such similar productions,

Comparatively then speaking, secondary as all such operations most certainly

DURATION OF THE WORLD. 77

certainly were, they yet will, I flatter myself, have the happy effect of gradually preparing the mind for what is now to follow.

SECTION

The Sixth.

A FEW reflections it may not, however, be amiss previously to offer. They seem to be naturally suggested from the whole of the preceding facts; yet their truth will be still more obviously confirmed in the sequel of this enquiry. In short, the celebrated Greeks and Romans, the Egyptians, the Chinese, the Indians, the other Asiatics, together with the animals and vegetables contemporary with themselves, but existed upon the

surface of countries, whose very deepest recesses every where exhibit the most obvious scenes of past and universal animation, and of slow, progressive, and uniform formation; and which, in common with the rest of the globe, have equally participated in the most striking and interesting revolutions;—revolutions indeed so sensibly important, so universally diffused, and so uncontrovertibly authentic, that we cannot without astonishment reflect, that they seem hitherto to have evaded the scrutiny and curiosity of mankind.

Upon all the natural facts which have hitherto been enumerated, let me once more generally observe, that
they

they have been mentioned principally to lead us on in that regular train of reasoning, which it is absolutely necessary to pursue, in the subject that we have here undertaken to illustrate. Though, at the same time, they may have curiously pointed out, in some few instances, a limited succession of events; yet still it is far more essentially necessary, and more pertinent to the subject of real philosophy, that they have afforded us a simple specimen of some important and uniform operations, and have very clearly suggested the gradual progression of nature, in the formation and production of a vast variety of substances.

SECTION

The Seventh.

HITHERTO, by the most gradual steps, I have traced the curious object of our enquiry; and it must, I hope, have been sufficiently evident, that appearances in Nature, though stamped with distinguished expressions, were no otherwise intended than as introductory to more extensive and interesting disquisitions; or as miniature outlines of what it is now my wish more strikingly to demonstrate.

G

Yet,

Yet, upon all the facts that I have hitherto and shall hereafter adduce, let me make this necessary observation, that, though such facts may seem, in variety of instances, singular and curious in themselves, they are by no means mentioned on account of that singularity; and should be still less regarded than those more extended reasonings, which they will be found ultimately to suggest.

In short, what are in themselves a few natural facts, purely local, or minute circumstances attending particular districts, when we are possessed of a philosophy that strikingly convinces us of the universality of their existence; and that brings every species

cies of substance, every surrounding object, and every district of the world, in equal confirmation of its authenticity?

The mountainous parts of Derbyshire may serve to present us with a fair specimen of facts, from whence the clearest and soundest reasonings unquestionably flow. Indeed the opportunities of tracing in this district, with accuracy, the internal structure of the earth, are such as are not every where to be met with. From the monuments here existing, what striking proofs are exhibited of that succession of time; which, while it overturns the trifling and ill-directed pursuits of modern antiquarians, gives

a new and forcible impression of every surrounding object.—With as much brevity and clearness as possible, I shall faithfully relate the state of some of the natural facts here alluded to; and which consist of such vast beds of various matter, regularly and successively formed, as cannot fail to carry along with them the desired impressions.

The first bed that presents, in the district of Darley Moor*, is that of a coarse, sandy kind of stone, which extends to the depth of one hundred and twenty yards. This is succeeded by a black, clayish composition, in-

* See Whitehurst's Enquiry, &c.; and see his Sections of the Strata of Derbyshire.

durated and, in a measure, petrified
 by time, equally deep as the former.
 Then comes a body of limestone,
 the depth of fifty yards; and, what
 is singular, the remains of a petrified
 crocodile, an amphibious animal,
 have been here discovered*. Next suc-
 ceeds a matter of black stone or mar-
 ble, resembling lava, the depth of six-
 teen yards. Another bed of lime-
 stone, the depth of fifty yards, is
 again incumbent upon black stone,
 the depth of forty-six yards. This is
 again succeeded by limestone, the
 depth of sixty yards. Once more
 succeeds the same black stone, the
 depth of twenty-two yards. And

* By Mr. Watson, of Bakewell.

this is followed by limestone, which has not as yet been penetrated.

And the limestone, in all these instances, resembles limestone in general; and, however singular it may appear, all the beds are variegated with innumerable impressions of sea-fishes.

Such is an imperfect view of an extraordinary state of facts! and but a specimen of scenes, which, if an opportunity of examination were afforded, would be found to be by no means uncommon!

Ought not then such circumstances for ever to convince us, how little we know,

know, how imperfectly we have reasoned, how obstinate we have been in supporting the most false and improbable conclusions?

In the present instance, a depth exceeding four hundred and eighty-four yards of various matter, it is most obvious, has been gradually formed by the hand of nature, through the eternal lapse of time.

Antiquity is sufficiently vindicated by the mere recital of such incidents; and will be still farther corroborated by others, of a nature equally singular, which we are now prepared to mention. Yet a few observations on those separate beds already enumerated, though

they can add but little to the force of the testimony, may, in the mean time, serve to amuse, and perhaps elucidate the matter.

The first bed is that of the coarse, sandy stone, which, from the attrition of its particles, rounded as stones upon the sea-beach, would seem to have been produced by the action either of rivers or of the ocean; circumstances of time and situation having changed it into its present massy consistency. That the extensive bed of clay has been the regular work of time, is also evident from its situation; being placed over the first bed of limestone, in which animal impressions are observable, and more particularly the distinguished one
of

of the crocodile. The various beds of limestone and of black stone, which follow, present a singular and extended prospect of antiquity. That the limestone, in every instance, has been formed by the operation of the ocean, cannot be disputed. The shell-fishes of that element are discernible in every separate mass.

In regard to the matter resembling lava, some curious circumstances ought to be attended to. It is interstratified between beds of limestone, all of whose fractures and fissures (in many of which minerals are contained) correspond precisely with each other, notwithstanding the black marble or stone existing between them,

unfractured, and unaffected with the convulsions that occasioned such fractures. It would then seem to follow, that the matter resembling lava had flowed laterally, from a volcano, that had never made its appearance above the surface of the earth; and which had been prevented from ascending by the vast incumbent weight. A variety of other circumstances seem strongly to corroborate this supposition. Among the rest, the beds of the matter resembling lava are not equally thick, nor do they extend equally far; and the clay, upon which they are situated, appears, in some instances, burnt as much as an earthen pot or brick*.

* See Whitehurst's conjectures upon this lava.

We shall now proceed to other appearances, in this mountainous country, that demand an equal attention. This district, like every other, has undergone, at various periods, such violent agitations from earthquakes, and other similar convulsions of nature, as at first can scarcely be credited; but which will afford no longer matter of surprise, when we hereafter shall have occasion to mention their universal and important influence.

The separate beds already described prevail throughout a vast extent of country; and appear, in many districts, to have been fractured in the most curious and singular manner; nay, in some places, huge masses of them

them seem to have been entirely swallowed up.

It even appears next to a demonstration, that other immense beds had formerly been incumbent on the sandy stone, the first of those beds that I have so particularly mentioned in the facts of Darley Moor*; and it is highly probable, that they have disappeared in some of those dreadful convulsions, which have disordered this whole mass of matter.

Indeed, when the miners have occasion to dig in the adjacent vallies, they often find them filled up with fragments of those superior beds,

* See Page 84.

which

which appear to have been wanting. But, what is more decisively convincing, wherever this sandy stone, already taken notice of, is observed to dip*, it is actually covered with some hundred yards of clay, coal, and argillaceous stone; which last is of a brownish colour, and, when applied to repair the roads, soon returns to its primitive clay. And all these separate beds, except the coal, (which, by the bye, invariably is generated in similar situations) contain figured stones, representing a great variety of vegetables, or, more properly speaking, the impressions of them; as reeds of various kinds, jointed at different dis-

* See Whitehurst's Sections, &c.

tances,

tances, ferns, corns, grafs, and many other species of the vegetable kingdom*.

Then what vast scenes of vegetation! what happy and long continued settlements must such diftricts have afforded, for the exiftence of men and other animals! The compofition of thefe indeed, fubject to a hafty putrefaction, diffolution, and decay, but ferves to increafe the general mafs of matter. And thus fuch veftiges, though often met with, are yet lefs frequently fo than the other branches of animated nature.

* Prodigious variety of fuch curious productions are in different museums throughout the whole of Europe;

SECTION

The Eighth.

THE knowledge of such facts may perhaps induce us to change as well our general notions of nature, as of antiquity. No longer are we to regard the loftiest mountains, as of original and permanent existence. Formed, as well as ourselves, by gradual processes, they are subject to the most regular changes. At one period they rear their lofty summits to the skies; at another, no longer exist. Thus is every production of nature unstable,

unstable, and subject to perpetual variations.

Nor do such vast revolutions simply testify a boundless lapse of time. Other important and instructing lessons they hold up to the contemplation of mankind. Substances that we meet with the farthest from the surface of the earth, carry with them the visible impressions of animated existence, and of progressive or gradual formation.

In short, that the world should have thus been agitated in unobserved confusion, is the most unnatural of suppositions. On every such occasion, the human species evidently must

must have been present. Nor is it by any means reasonable to suppose, that mankind have existed in any considerable degree more numerous at any one period than at another. Ever have they fluctuated in their population, or increase and decrease, either as art or nature have afforded them more or less of the means of subsistence.

That vegetables and fishes were in being, in the very remotest antiquity, their obvious remains in every species of stone, at the very bottoms of mountains, and in each country of the globe, strikingly demonstrate. And of the equally remote existence of animals in general, circumstances

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may

may be brought which are unquestionably conclusive.

The existence of vegetables and fishes, already explained, would have been the strongest presumptive proofs of this; but we also find, that in each quarter of the world the remains of the human species, and those of a vast variety of animals, are every where met with in a fossil state.

The situations in which these sometimes occur, bespeak the most decisive and distinguished antiquity. The bones of the human species, for instance, have been found petrified in great abundance, at a considerable depth, in the rock of Gibraltar*. Though changed

* See specimens of such in the British Museum.

into

into stone, the minutest parts of the human skeleton are at once to be distinguished. The bones of the head, the teeth, those of the arms and of every distinct member are perfectly visible. Appearances similar to those at Gibraltar, as well as the bones of a variety of animals, have also been discovered in the rocks of Dalmatia, upon the eastern coast of the Adriatic. Not many years ago, two large teeth and part of the trunk of an elephant were met with, transmuted into stone, in a lead-mine in Flintshire, forty-two yards below the surface of the earth. Other such remains of elephants have been discovered in different districts of England, and throughout

various parts of Europe*. In short, instances of the bones of animals, petrified or changed into stone, have every where presented themselves.

Much might be said on the petrified state in which these bones, as well as other substances, are met with. The slow advance of petrification in many instances, and the surprising progress that various substances have nevertheless made towards it, afford perhaps the most ample field for speculation.

The vast rocks, the mountains of stone, the immense districts of such substance; in short, every species

* See specimens in the British Museum.

and

and every particle of stone or petrified matter existing, demonstrably appear to have been gradually and progressively generated. That stone has not originally been in that petrified or hardened state, in which it is at present met with, various circumstances sufficiently convince us.

In the very middle, for instance, of the largest bodies of marble and limestone, and those too at the greatest distance from the surface of the earth, one may plainly observe impressions of the animals of the sea. In immense masses of stone, of a very different quality either from marble or limestone, vegetable productions are no less conspicuous.

The facts already suggested, sufficiently support our assertions; and, indeed, were it necessary, innumerable are the proofs which might still be adduced.

Let us then once more repeat, that at the greatest depth we ever yet have been able to descend below the surface of the earth, one may plainly discern the remains of the vegetables and animals of the land and sea, enveloped in the substance of rocks.

What astonishing prospects! What a maze of antiquity does all this present! Conception itself is unequal to the contemplation. Yet what arguments,

guments, what proofs, what facts can make an impression upon men that are prejudiced and superstitious! Taught to domineer it over nature, truth, and reason, they will not admit their light, but are callous to conviction upon every such occasion. Lasting enemies to good sense, strangers in speculation, and too often in practice, to what is real virtue and morality; at mortal variance with every thing that is mild and amiable in life; they eternally oppose both their own happiness, that of mankind, and the real interests of society.

SECTION

The Ninth.

IT may not be here improper to observe, that, from the chemical resemblance of the matter constituting the lime-stone and marble, with that of the testaceous matter of shell-fish in general, and the plants or productions of the coral-kind; from the rapid generation of these last, from the immense beds and districts of shell-fish that every where present themselves; and from such substances uniformly occurring in the
contexture

contexture of these kinds of stone; it has with some reason been conjectured, that marble, lime-stone, and the calcareous matter in general, derive their origin from animated productions; and become thus differently modified by combinations that we are but little acquainted with, hardened by time and diversified by circumstances of situation. Specimens, indeed, of lime-stone are frequently met with, composed of nothing else but testaceous matter, plants of the coral kind, or shells compacted together. Concerning the other species of stone and earth, it might with equal justice be conjectured, that their existence is necessarily dependent upon the decay of animals

and vegetables. Daily experience convinces us of earths generated in this manner. And the wrecks or the impreffions of land vegetables and animals are visible, at the centers of the largest rocks.

It is, however, by no means necessary, in this part of our enquiry, absolutely to decide upon a matter of such curious speculation. It is sufficient for our present purpose to demonstrate, that every species of stone, let its kind be what it may, indisputably takes its form in the gradual succeffion of time.

As to the change of a variety of substances into stone by means of petrifying

trifling waters, and their singular reference to antiquity, interesting lights might be thrown out, could we, in the different instances, but demonstrate the exact time of the process. That such changes often advance exceedingly slow, need not be insisted upon.

The late Emperor of Germany, in order to satisfy his curiosity in so important a particular, having first obtained permission from the Grand Signior, caused some piles of wood to be drawn up, on which the bridge which Trajan had thrown over the Danube had been founded. They examined attentively these wooden piles, and observed that the petrification

was

was advanced no more than three-fourths of an inch in fifteen hundred and some odd years. From this circumstance they concluded, that a piece of wood of equal thickness and forty feet in length would be petrified an inch in twenty ages; and would employ, to arrive at its total transmutation, ninety-six thousand years. As trees have been taken up petrified, whose trunks were more than forty feet high, and their thickness in proportion, people may judge, say they, of the time that they have been thrown down or buried.

This reasoning is, however, far from being conclusive. In certain circumstances and situations, petrification

faction may be supposed to advance in a manner totally different, and with much greater rapidity than it does in the waters of the Danube; yet the fact is remarkable, and a thousand parallel instances may be produced. It is indeed a matter worthy of observation, that the quantity of earthy particles in the waters, that are possessed of a petrifying power in the highest degree, is but very inconsiderable; and that the process of petrification, in such cases, must unavoidably be conducted in a gradual, flow, and uniform manner.

SECTION

The Tenth.

YET whatever extended notions of antiquity the gradual or progressive formation of earth, stone, and a variety of bodies must have unavoidably suggested, there is another process of nature not less interesting; and which indeed is equally pertinent to the subject upon which I am treating.

The minerals then themselves appear to be by no means primary productions of nature. Long has it been
I erroneously

DURATION OF THE WORLD. 111

erroneously conjectured by mankind, (ever subject to delusion!) that the earths, the stones, the minerals, were originally created such as they are found, and that they thus continued permanent and immutable. Surrounded by an immensity of matter; their own substance but a trifling modification of a small part of that immensity; coming to and forsaking their present state of being by a gradual progression; one might have thought, that the human species should have extended that analogy. Why have they thus assumed to themselves properties so totally distinct from every species of existence, and from that mass of matter, of which, though indeed a part, they
are

are yet so insignificant a proportion?

Like every other being, and like every species of substance with which we are acquainted, the minerals themselves take their origin in the gradual succession of time, by processes of nature with which we are by no means familiar. Their ores indeed are sometimes met with, scattered by fragments in beds of earth, horizontal or inclined; yet these are far from being the places of their origin. They have been conveyed into those situations by the earthquakes and convulsions, which, it will be hereafter demonstrated, have ever agitated the globe. The fissures and the caverns
of

of rocks are the great workhouses, where nature carries on such curious operations. And even those very caverns and fissures, which thus produce the minerals, are themselves formed, and every where surrounded with immense masses of matter, replete with the impressions of every species of animated nature; and carrying themselves, in their very construction, undeniable proofs of the most progressive, slow, and uniform formation.

The mineral particles, distilled from such surrounding rocks, are continually crystallizing and increasing in quantity.

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In short, let us finally repeat, that the fissures of rocks, the bottoms and sides of caverns, daily incrust with every species of mineral substance.

Concerning the properties of air and water, hitherto little has been said. Fluidity indeed, or, more properly speaking, fluid bodies, are to be considered as solids melted by heat. Those solids, it is evident, participate of the nature, and are as progressively formed, as any other body whatever. That fluidity is in most cases the effect of heat, needs not to be insisted upon. There is scarce any substance, which cannot, by heat, be brought into a fluid state. Quicksilver itself has been congealed, by exposure to a certain
5 degree

degree of cold. In short, daily experience convinces us of the fluctuation and continued generation of air; and, like other species of matter, the waters themselves undergo eternal changes and revolutions. Experiments have been made, that would seem to demonstrate, that a very considerable production of earth may be obtained from water, by means of a peculiar exposure to heat. But what occasion is there to insist upon a circumstance of an ambiguous nature? A fluid that may be reduced to a solid, that circulates in unceasing fluctuation, that enters into the composition of most bodies, cannot be conceived, without being continually destroyed and regenerated.

SECTION

The Eleventh.

FROM the observations that have already preceded, and from those which are still to follow, it will, I flatter myself, be sufficiently demonstrated, that earths, stones, and minerals are as much the regular product of time and of nature, as any animal or vegetable being that exists.

The globe itself then would appear to us to be principally constituted of
I
earth,

earth, stone and mineral substances. At all events, matter, or the constituent particles of the world, and of every species of existing substance, has been, and is still, in a rapid revolution.

Yet, as the greatest depth that we have ever descended is but very inconsiderable ; and as mere supposition, however well supported by reason and analogy, still leaves the mind in a state of suspense ; and, as natural facts alone, and such as are well founded and obvious to the senses, can bring us to an absolute certainty and conviction ; let us for a moment turn our attention to the elevations, to the mountains of the world.

Of these the Pyrenees, the Alps, and the Andes merit a distinguished consideration. The Andes particularly, extending nearly the whole length of South America, are elevated, in some places, upwards of three miles above the level of the sea.

The summits, the centers, the bottoms of such mountains, are merely constituted but of those very substances, that have so particularly engaged our attention.

Their earths, their stones, their minerals are like the earths, the stones, the minerals of every other district. The earths and stones, more particularly,

particularly, have, within their contexture, all the distinguishing appearances of animal or vegetable impressions, or of regular formation.

Thus then are mountains principally constituted of earths and stones, while it has been most decisively demonstrated, that those very earths and stones themselves have been gradually and previously constituted.

Like a house that is formed of different materials, the materials were previously formed by nature; and as the house decays, so do the mountains. Nor are the substances of which mountains, and the world itself, are composed, exempt from perpetual

change and variation in their composition. In short, fruitless is the search for a modification of existence permanent and immutable !

And yet, though matter ever thus is agitated,—and nature changes forms,—her forms do all exist. Though men are seen to die, or change existence, the human species flourish in eternal being !

S E C T I O N

The Twelfth.

NOR ought that appearance of the world, which is erroneously called the disordered face of nature, to escape our attention. The stupendous rocks, the mountains as it were cloven afunder, the shores of the ocean impending, the adjoining waters unfathomable, are but so many striking monuments of those dreadful convulsions, which have ever agitated the globe. And whoever seriously considers the violent effects of earthquakes

quakes recorded in the various annals of mankind, or those which have more recently occurred, never can be surpris'd at the ruins and confusion every where visible.

‘ In the earthquake which destroy-
 ‘ ed Lisbon, in seventeen hundred
 ‘ and fifty-five, the mountains of
 ‘ Arrabeda, Estretta, Julio, Marvan,
 ‘ and Cintra, being some of the
 ‘ largest in Portugal, were impetu-
 ‘ ously shaken, as it were, to the very
 ‘ foundations; and some of them
 ‘ opened at their summits, split, and
 ‘ rent in a wonderful manner, and
 ‘ huge masses of them were thrown
 ‘ down into the adjacent vallies.

‘ A fine

‘ A fine stone quay, where the
 ‘ merchants landed their goods, where,
 ‘ at that time, about three thousand
 ‘ people were assembled for safety,
 ‘ was turned bottom upwards; and it
 ‘ appears that the water, where the
 ‘ quay stood, is now an hundred fa-
 ‘ thom deep. A sea-port, called St.
 ‘ Ubals, was entirely swallowed up,
 ‘ people and all. In Morocco, the
 ‘ earth opened, and swallowed up a
 ‘ village, with all its inhabitants, to
 ‘ the number of ten thousand per-
 ‘ sons, together with their cattle of
 ‘ all sorts, as camels, horses, horned
 ‘ cattle, &c.; and soon after the earth
 ‘ closed again in the same manner as
 ‘ before. The famous city Tasso was
 ‘ wholly swallowed up, no remains
 ‘ being

' being left. One of the Sarjon hills
 ' was rent in two ; one side of which
 ' fell upon a large town, where there
 ' was the famous sanctuary of their
 ' prophet, known by the name of
 ' Mula Teris ; and the other side of
 ' the same hill fell down upon ano-
 ' ther large town ; and both towns
 ' and inhabitants were all buried un-
 ' der the hill. The earthquake was
 ' more terrible in Barbary than at
 ' Portugal ; at Mequinez, that part
 ' of the city, where the Jews resided,
 ' was entirely swallowed up ; and all
 ' the people of that sect, being about
 ' four thousand in number, perished,
 ' except seven or eight. And, how-
 ' ever singular it may appear, it is an
 ' undoubted fact, that, at the very
 ' time

‘ time of this earthquake at Lisbon,
 ‘ the people working in the mines of
 ‘ Derbyshire were greatly alarmed by
 ‘ agitations of that district, and with
 ‘ explosions, as it were, of can-
 ‘ non *.’

‘ In the year sixteen hundred and
 ‘ ninety two, a great part of Port
 ‘ Royal, in Jamaica, was sunk by an
 ‘ earthquake, and remains covered by
 ‘ the water several fathoms deep ; on
 ‘ the north side, above a thousand
 ‘ acres of land sunk. Some moun-
 ‘ tains along the river, betwixt Spa-
 ‘ nish Town and Sixteen Mile Walk,

* See Whitehurst, where these, and a variety
 of such instances, are selected ; and see Philoso-
 phical Transactions.

‘ were

' were joined together ; and others so
 ' thrown on heaps, that people were
 ' forced to go by Guanaboa to Six-
 ' teen Mile Walk. At Yellows, a
 ' great mountain split, and fell into
 ' the level, and covered several settle-
 ' ments. Another plantation was re-
 ' moved half a mile from the place
 ' where it formerly stood. In Cla-
 ' rendon precinct, the earth gaped
 ' prodigiously ; and all over the island
 ' there were many thousands of open-
 ' ings. But in the mountains are
 ' said to have been the most violent
 ' shakes ; indeed they are strangely
 ' torn and rent, infomuch that they
 ' seem to be of different shapes now
 ' from what they were ; especially
 ' the Blue, and other highest moun-
 ' tains,

' tains, which seem to have been the
 ' greatest sufferers. And a large,
 ' high mountain, near Port Morant,
 ' near a day's journey over, is said to
 ' be quite swallowed up; and in the
 ' place where it stood there is now a
 ' great lake. The Blue and its neigh-
 ' bouring mountains used to afford
 ' a fine green prospect; now one
 ' half of them, at least, seem to be
 ' wholly deprived of their natural
 ' verdure. There one may see where
 ' the tops of great mountains have
 ' fallen, sweeping down all the trees
 ' and every thing in their way, and
 ' making a path quite from top to
 ' bottom*.'

* Philosophical Transactions.

' The

‘ The Pico in the Moluccas, ac-
 ‘ counted of equal height with that
 ‘ of Teneriffe, was sunk by an earth-
 ‘ quake, and quite swallowed up into
 ‘ the earth, and left a lake in its
 ‘ place*.’

‘ In the year sixteen hundred and
 ‘ forty-six, many of those vast moun-
 ‘ tains the Andes disappeared, and
 ‘ were totally lost †.’

In short, the vestiges of such vio-
 lent operations present themselves in
 every district of the world, and are
 the strongest testimony of an un-
 bounded succession of events.

* Dr. Hooke's Posth.

† Dr. Hooke.

What idea can we have of that time, which has thus afforded an universal existence to incidents, that make their dreadful appearance so rarely in the limited span of human existence!

Such then are nature's operations! and once more let us say, That, as the vegetables rise and fall, and men exist and die, the earths are formed, and vary in their natures. They sometimes change to stone; the stone again is decomposed by air, or worn away by time and friction. Or, all are swallowed in the bowels of the earth, and changed by fire, or by nature's hidden operations.

SECTION

The Thirteenth.

THUS have I taken a general survey of an extensive part of nature! And her uniform progression, in the formation and decay of every species of existing substance, is far too obvious to be any longer insisted upon. But, in variety of instances, we have, however, observed, that the productions of the ocean have been met with in the most stupendous masses of rocks. From what has already been suggested, we must unavoidably

ably be convinced, that the ocean has been stationary in districts where it now is not, for periods altogether inconceivable, and has there deposited, in great abundance, its vast productions. But, having gradually forsaken its former situation, scenes of vegetation have then taken place, of perhaps an equal duration.

And from some of the facts already mentioned, we have even been induced to suspect, that its advances and retreats have been repeated in a multiplied succession.

Our attention then necessarily seems attracted to circumstances of a truly interesting nature. And while, in the remainder of this disquisition, the su-

perificial part of the globe is alone the scene of our speculation, never ought we to forget, That the vegetables, the animals, the stones, the earths, the minerals, and in short every existing substance, equally participate of gradual formation, and real dissolution or transmutation. Such reasonings alone will ever be found essential to sound philosophy, and the true knowledge of antiquity.

I shall now proceed to give my opinion concerning the singular influence of the ocean ; less desirous to demonstrate a succession of time, than still farther to confirm what has already been said ; and to give an idea of the uniform operations of nature,

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which

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which seem hitherto to have been but little attended to.

Struck with the indelible marks of past inundations every where visible, a multitude of writers have attempted to account for such appearances. Labouring, however, to establish complex theories, or fettered by some reigning superstition, so far from clearing up the matter, they seem only to have involved it in still greater obscurity.

In regard to these important operations of nature, simplicity should take place of elaborate system.

Collected in the vast extent of the ocean, the waters, by their continual agitation, have produced the greatest changes on the surface of the earth. The marine productions every where met with, and which can only be the work of the seas, sufficiently convince us, that they have occupied successively every part of the globe.

Thus then may the boundless ocean be viewed in the light of a river, whose waters are constantly changing their direction. Except, indeed, with this difference, that the rivers, though they gradually change their ancient channels, yet such change is minute, and confined to a particular district and
portion

portion of time : Whereas, in the case of the ocean, the change is immense, and of the most important nature ; in the great lapse of time, its waters successively, though irregularly, occupy and desert every part of the world,

The currents of this element would even appear, in some few instances, to have hollowed vallies, and to have raised hills, which in their windings correspond with each other. And, such are the changes of earth into water, and water into land, that we may be confidently assured, such alterations as have been, still are, and ever will be made.

What follows, then, from this undoubted state of facts? The charming seats of vegetation, the numerous islands of the world, the vast continents themselves, in the course of time, will exist no longer as such; but, immersed in the waters of the ocean, will undergo the most inexpressible alterations.

That restless element, on the other hand, gradually forsaking its ancient boundaries, will leave the districts it now covers prepared for scenes of luxuriant vegetation,—for the happy settlements of succeeding generations!

Nor are there wanting causes, unquestionably adequate, to bring about
this

this astonishing change. In short, our ideas once sufficiently elevated and cleared, in respect to the important object of enquiry, other difficulties will be easily surmounted.

Variety of circumstances, then, are continually, but gradually, conspiring to effect the sea's flow, but no less certain, change of station.

Among the most essential of these, may be enumerated,

The vast alterations perpetually made upon the surface of the world, by earthquakes and volcanos.

The agitation of the waters of the ocean, from whatever cause.

The

The discharge of different substances from the mouths of a multiplicity of rapid rivers,

The constant generation of marine productions, both vegetable and animal.

Shores washed away by the seas continually beating against them.

In short, whatever thus obstructs, or gives a freer passage to the waters of the ocean, insensibly occasions the retreat or advance of that element.

Elevating the mind to remote antiquity, granting that there have been periods of time sufficiently extensive,
it

it cannot be denied but that such causes are amply sufficient to produce the effects, however uncommon, that have hitherto, and shall hereafter command our attention.

They account very satisfactorily for the appearance of shells, of sea-fishes, of coral, of limestone, and other marine productions, constituting the summits and bottoms of the highest mountains, and other vast portions of the terrestrial globe.

SECTION

The Fourteenth.

IT is necessary here to observe, that some alteration, as to the situation of countries, or the position of the axis of the world, has of late been suspected actually to take place. A few modern philosophers have even been induced to think, that this circumstance alone could have altered the position of the sea, and have produced those extraordinary effects which are every where observable. Yet, should we even be induced to grant the
the

the existence of such a change, it must be allowed to be of a slow and gradual progression ; and, certainly, though silent, and unobserved by the scrutiny of mankind, it may be conceived to produce great and important effects. Yet even then, it could only conspire with those numerous and interesting influences already enumerated.

It is however, perhaps, somewhat doubtful, whether this change, which they contend for, has or has not taken place. At all events, the alteration seems to be of a nature that as yet admits not of demonstration : and, till such proof is actually brought, it will be ever received with distrust, by men who found their reasonings upon

upon no other basis than that of undeniable facts.

The vast variety of productions, however, similar to those now met with only between the tropics, that have been discovered petrified in the northern latitudes, (occurring too in stone and other matter constituting the countries of such colder regions; and in situations where innumerable circumstances demonstrate, that the animals and vegetables, of which they are the remains, have been generated, lived, and died in the very districts where such petrifications are at present found), give a very considerable strength to this opinion. They would seem indeed to convince us, that a change

change in the position of the axis of the earth has taken place, and the same causes continuing, will take place, from some unobserved operations of nature.

Were such a change once admitted, the consequences may absolutely have been, that the countries which are situated at present under the scorching rays of the sun, at periods remote may have obtained another situation, and may be conceived to have constituted the polar regions of the world. And that the inhospitable regions, on the other hand, now covered with a deep and lasting snow, in their turn may have equally luxuriated in all the felicity of more happy and warmer climes.

Yet

Yet whether this cause, granting it to exist, should be received as equally essential among the many obvious ones already mentioned, is much to be disputed. Could we even be clear in our determination, whether it operates powerfully, though slowly, or not at all, in changing the situation of the waters, it would perhaps be found by no means consequential.

For the facts which are the fullest proofs of the sea's perpetual advance upon the dry land, are of the most striking nature. They impress us with prospects truly astonishing; and convince us sufficiently, that the same powers at present exist, which,
silent

silent as the lapse of time, have already produced slow, but universal effects.

Enormous quantities of shells of every kind, corals, sea-fish, limestone, marble, chalk, calcareous earth, beds and even deserts of sand, with other numerous remains of marine productions, are met with in every quarter of the globe, in some measure constituting the countries of the world itself.

The truth of these assertions cannot be disputed; this enquiry has already afforded repeated proofs. Yet, out of those innumerable facts that might

L. still

still be adduced, it may not perhaps be amiss to select one, as a still farther corroboration.

In Touraine, a province of France upwards of a hundred and eight miles from the sea, throughout a district of eighty square miles, eight or nine feet below the surface, they come to a bed of shell-marle, constituted chiefly of oysters and other marine productions. These shells are found to extend, in many districts, to an unknown depth, but, upon the whole, at least to the depth of eighteen feet; and will be found to amount, upon the most limited computation, to a hundred and forty millions of cubic fathoms

fathoms of shells, mostly decayed and broken into fragments*.

That such curious and familiar objects are, universally, the genuine offspring of the sea, will be readily acknowledged. The shells and fishes, in some districts, are still found to retain their marine matter, though much decayed. But of the prodigious quantity of shells transmuted into stone, some are found whole, others broken, many bored through by an animal well known to prey upon the living fish; and they have the same effects, used chemically, medically, and in agriculture, as those taken immediately from the ocean.

* M. de Reaumur.

The shell-fish of the same kind are of all sizes, some young and others old. They form distinct beds of oysters, cockles, &c. Their smallest articulations may be remarked, and even the pearls are observed that the living animal produced. The teeth too of many of the fishes are in such a state, as sufficiently to convince us that they have been made use of, and consequently that they belonged to animals that once were alive. The appearance of the limestone rocks upon the tops of mountains, and in the various districts of the world, is no less conclusive.

And that all this has not been occasioned, as has been vulgarly conceived,

ed, by any universal inundation of the ocean, is demonstrable, both from the fishes petrified in the beds of limestone, which seem to be in the places where they have been generated, lived, and died, forming distinct beds of oysters, cockles, &c., and oftentimes deposited with as much regularity as beds of living shell-fish are in any part of the sea; and from the various marine productions which, in variety of instances, are separated by immense beds of vegetable or other matter.

Such are indisputed monuments of a singular succession of events! such the proofs that the sea is by no means stationary! They indeed seem to

prove to us, beyond all manner of controversy, that this element, at repeated and different periods, has exercised every where its dominion!

Nature testifies this by a variety of different instances. Circumstances render it evident, that many of the islands of the world have, one time or other, been the highest land of adjoining continents; and it is not improbable, that those continents themselves, as it has already been suggested, alternately have been buried, and have emerged from the ocean. From this reasoning, then, it follows, that the various islands of the globe, as they have many of them been joined to some other country, so will they at
future

DURATION OF THE WORLD. 151

future periods exist no longer as islands. Either the sea departing will leave them portions of adjoining continents; or, by its certain though slow advances, immerse them in its restless waters.

A curious circumstance it may not be amiss here to mention, though not with any kind of view to confirm the preceding reasonings, as they stand in no sort of need of confirmation from facts that are ambiguous. The whole of the islands of the South sea would seem to have constituted one vast aggregate. Without the possibility of communication, the inhabitants of Otaheite and New Zealand, separated

by the sea two thousand miles from each other, have, nevertheless, been found to speak nearly the same language.

SECTION

The Fifteenth.

HERE let me observe, that in these transitions, the seas in some instances are seen to forsake their antient stations with rapidity; in others, and indeed much more commonly, by the most gradual retreat; and where the waters of the deep have been well known to rage, they now leave districts prepared for the beautiful scenes of vegetation.

On other occasions the ocean is observed to obtain the superiority, either by a slow and certain approach, or by
bursting

bursting in at once, and overwhelming every thing in an undistinguished ruin.

The various desertions here suggested are sensibly discerned by those who border upon the sea-coast. Throughout the whole of Europe, towns celebrated as the most distinguished sea-ports, at present are met with thirty or forty miles distant from the ocean. To specify particular instances of these deserted places, is altogether unnecessary. In short, the histories and traditions of every country abound with such remarkable appearances.

On the other hand, within the memory of men, whose situations afford them an opportunity of making
such

such observations, the gradual encroachment of this element is equally observable; and though those advances are often of the slowest nature, yet, in the course of time, it may easily be conceived, that effects of the first importance must, from the continuance of such encroachments, inevitably take place.

The Baltic, for instance, has destroyed and overwhelmed, among many others, the famous port of Vinita; and covered by flow degrees a large portion of Pomerania.

In the same manner the sea washing the coast of Norway, is well known to have detached several little islands from the main land, and is
still

still making daily depredations upon the continent.

The German ocean encroaching by degrees upon the shores of Holland, near Catt, overwhelmed the ruins of an antient citadel of the Romans, which had formerly been built upon that coast; and which is now actually under the water.

Such are instances of the sea's gradual encroachment! It now remains to give a few examples of its more sudden advances. In the reign of Henry the First, that element overflowed, with a sudden and alarming inundation, the extensive estates of the Earl of Godwin, and has formed that bank distinguished, even to this day,

day, by the name of the Godwin Sands.

Two hundred and fifty years are past since a similar eruption drowned, in the territory of Dort, an hundred thousand persons, and a still greater number in the neighbourhood of Dullart.

A melancholy inundation, it is universally known, buried in modern times, with a vast rapidity, the half of Friezland. Not more than sixty years ago, the church-steeple of eighteen villages near Mardike testified the unhappy event. They then appeared above the surface of the sea, but have since yielded to the force of the waves.

It

It may not be amiss in this enumeration of facts, thus testifying the sea's important and rapid encroachments, to make some mention of that account, which has been delivered by Plato of the Atlantic land. In his detail of the particulars relating to the country in question, he lets us know, that they were handed down to him by the celebrated Solon. That distinguished sage of antiquity had travelled into Egypt, and received his intelligence of the matter from an obscure tradition of the Egyptian priests. The world have long regarded the whole of this singular narrative as an ingenious fable; but the circumstances so recently enumerated give us the greatest reason to

to presume, that something of a similar nature actually may have taken place.

A considerable time is past, says Plato*, since the land of Atlantes was in being. It was as large as Asia-Minor and Syria united, and was situated near the pillars of Hercules in the Atlantic ocean. The imagination of the poetical philosopher exults in the description of those numerous advantages, which the inhabitants so long enjoyed in that charming region. This felicity, together with their distinguished refinement, terminated, however, by a dreadful and unexpected inundation. For the

* See his Timæus.

sea,

sea, suddenly forsaking its antient station, at once overwhelmed the country and drowned all its inhabitants. At present, not even the smallest vestige of such a land is any where to be met with.

The inundations of the ocean that have been esteemed universal, and recorded in the traditions or various annals of mankind, would seem here to solicit some attention. Partial encroachments of the sea, which have ever existed, must alone have given rise to these vague and inconsistent narrations. In an uncultivated age, when men were ignorant of the established laws of nature, every little incident

dent was exaggerated, and might have been sufficient to have given birth to the most absurd and incredible conjectures. The insufficiency of the water of the ocean to cover the whole earth, the unnatural supposition of a great and interesting part of nature being at once destroyed, the inconsistent manner in which all such stories are ever related, impress us with insurmountable incredulity. In short, they never can be received, never can be thought reconcileable to reason, by the sensible and enlightened part of the human species.

In the place then of commenting upon fabulous stories, the effusions of ignorance and error, may it not be

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full

full as well to give some general hints, which may for ever caution mankind, from being easily captivated with similar delusions?

Let us separate circumstances, that are of an improbable nature, from the narrations of remote or distant history. Whenever we entertain ourselves with the transactions of the past times, never should we enter upon them but with the firmest persuasion, that the incidents which glaringly contradict the established laws of nature, are but the dreams and erroneous conclusions of men, involved in barbarism and obscurity. Is it possible, without an eye to this, to peruse with any kind of advantage the antient errors of mankind?

Our

Our immediate predecessors were firmly and universally persuaded of the real existence of the merest phantoms of imagination. To enumerate the many instances of their folly, would be but a painful task. The intelligent, indeed, feel themselves hurt by such narrations. To conceive himself allied to a species capable of such glaring misconceptions, can, in fact, never be flattering to a man endued with superior reason and sensibility. Let us, however, select an historical circumstance from the multitude of those that reflect satire and disgrace upon human nature. The unbounded influence of sorcery and witchcraft was never once disputed, among our almost immediate ancestors; and it is

a well-known fact, that a number of the human species, in these days scarcely to be credited, fell victims to such groundless superstitions. Were men, however, ignorant and credulous enough in the present age, to assert with confidence the real existence of such imaginary beings, the natives of Europe at least have acquired just discernment sufficient, to see the nature of such delusion. But why do those very Europeans still so far countenance folly, as to give an unlimited credit to similar fables and absurdities of antiquity? Are the present natives of Europe any worse for being a little wiser than their ancestors? And can it, at this day, injure the morals of society, or the interests of mankind,

to

to make them still a little wiser than they are; to divest them of a part of their folly, and to prevent them from falling again into groundless and false suppositions, tending to destroy or at least to set them at variance with one another?

These last observations are unquestionably true, yet, however true, might in this place have been entirely omitted. In short, fabulous stories and circumstances, glaringly contradicting the established laws of nature, can only be received by those who blindly receive any thing. Such as are incapable of distinguishing the links of probability, eager-

ly embrace the wonderful in every narration. The beautiful simplicity of nature and truth solicits in vain their attention !

SECTION

The Sixteenth.

IT would however be unpardonable in me to omit mentioning some circumstances, of a widely different and of a more interesting nature. What appear to be the undoubted remains of tropical productions, both of the animal and vegetable kind, whose former existence evidently seems to have depended upon the sun's direct influence, have been discovered petrified in high northern latitudes; where such stones and petrifications as I have before mentioned, are so

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abundant, as even in some measure to constitute immense districts and portions of the countries, where they are at present found. Within the contexture, for instance, of prodigious masses of stone, throughout the northern regions of Europe, the impressions of plants are observable. These plants are chiefly of the capillary kind, but sometimes of a peculiar species of fern, both well known to be similar to the present natives of the tropical regions*.

Remains of elephants and crocodiles changed into stone, have been discovered in England, Germany, &c.

* Many such specimens are in the cabinets of the curious.

as

as also have the teeth of sharks; and a vast variety of shell and other fishes present themselves, impressed upon stones, in the various parts of Europe, which at present no where exist but in the East and West Indies, and other such tropical situations. And all these appearances of vegetables, animals and fishes, found remote from their native regions, are accompanied with variety of circumstances, which sufficiently indicate that they were generated, lived and died in the very districts where their petrifications are at present discovered.

In short, how these productions ever could come into those northern situations, may well excite our astonishment.

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nishment. They would seem indeed almost decisive, to establish the reasonings previously suggested, in respect to a change in the latitudes of countries. At all events, those climates must, originally, have been suited to the nature of the existence of such animals and vegetables. If then these circumstances should be thought inconclusive in proving, that an alteration in the position of the axis of the world has actually taken place; they at least hold up, and that in the most striking point of view, some strange transitions through which each district unquestionably has passed, in the inexplicable duration of time.

SECTION

The Seventeenth.

SUCH then are the revolutions that take place upon the superficial parts of the earth ! And though in tracing these more minute operations, we have by no means been solicitous to demonstrate an uninterrupted succession of events ; yet I flatter myself, what has been suggested upon that subject may have made the desired impression. Let us, however, once more revert to that elevated species of philosophy, whose essential truths absorb every less important consideration. What is it to us how the climates

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mates change, and countries alter situations, or how the seas forsake their stations, when we are most undoubtedly convinced, that matter no where is at rest; that the very seas, the countries, and the world itself are composed of particles in eternal fluctuation?

These immutable truths should never be forgot: That animals and vegetables flourish and decay; that earths are formed by slow degrees; that they too change by time; that stone is formed, is decomposed or altered in its composition; that mountains now are elevated, now depressed;—that nature lives in motion.

SECTION

The Eighteenth.

FROM the whole of the facts it
must then decisively appear,

That not one single substance in
nature is either permanent or pri-
mary.

That the animals, the vegetables,
the earths, the stones, the minerals,
alike take their origin in the gradual
progress of time, and, in its unceasing
succession, are alike exposed to innu-
merable transmutations.

That

That the globe itself, from a multitude of causes, is subject to the most flow but interesting revolutions.

That it undergoes incredible changes from heat and cold, volcanos and earthquakes.

That vast alterations are perpetually made by the decay, generation, petrification, and other transmutations of vegetables and animals.

That the sea is continually altering the very face of the earth.

That in the eternal lapse of time, it alternately encroaches upon the dry-land, takes it from, and again restores it to its inhabitants.

And

And that gradual, but obvious influences occasion those numerous yet partial inundations, that have been found to make such deep and lasting impressions; and which have existed in every country, and left behind them the most visible marks of ruin and devastation.

SECTION

The Nineteenth.

IT is needless to multiply facts any farther, in proof of a succession of events of an amazing duration. In this enquiry, an extensive field has been opened for speculation. Facts of a singular nature are placed in a light in which they seem not hitherto to have been viewed. A man of common observation, who freely exercises the powers of his reason on the general appearance of things, will now be more equal to the task of this important investigation.

Let

Let it then suffice to offer a few general observations on the subject, easily deducible from what has already been said. Every circumstance then, every train of just reasoning on the facts related, in my humble apprehension, declare the human species, all animal and vegetable life, and the whole scene of nature to be of a very different antiquity, from what has hitherto been apprehended. We have seen for what reason, any thing satisfactory on the subject is out of the reach of human tradition; and enjoying so short an existence, is it to be wondered at if our notions of time itself are become surprisingly contracted? How familiar too in life are the instances of obvious inconsistency!

sistency! Ought we then to be much surprised, if in the general belief of mankind we meet with something erroneous? One part of the human species are without even the possibility of coming at any other knowledge, than that which is obtained by oral tradition, or by their own immediate experience. Ignorant of the arts of registering ideas, whole nations are without any written books, hieroglyphics, or other standing memorials whatever. Because they are not benefited in these respects as we are, the contracted and prejudiced among us are in some degree disposed, to degrade them from the rank of human nature.

Many

Many nations, 'tis true, are differently circumstanced; they have written observations. But of what nature are they?—Voluminous tracts whose contents are absurdities, that are greedily devoured by an undiscerning multitude!

As to the inestimable few, endued with superior abilities, who write in a rational and consistent manner, and whose clear discernment and sound understandings raise them above the ordinary level of mankind, how are they requited? Ignorance discovers not the truth of their observations; and, because they differ from the ignorant, they expose themselves to the censure of the greatest part of the world.

Do they then profit essentially by the advantages they possess? Elaborate fabricators of what have been erroneously esteemed unquestionable standards of refinement, seem either to have mistaken the interests, or to have intentionally imposed upon the senses of mankind. Instead of giving vigour to their judgments, do they not labour to render them incapable of judging, and spread a gloomy influence over the whole conduct of their lives? The dupes of the artifices of system and of superstition, what peaceable and spotless mortals! what valuable members of society! what virtuous models of perfection! Should such qualifications, such delusions, characterise the states-

men or the monarchs of the world, ought we to be surpris'd, if, blind to the real interests of society, they prove the tyrants or gothic rulers of mankind! Unhappy, truly, is the lot of men that chance to be directed by those, who, in the momentous circumstances of life, are incapable to direct themselves!

What pains are there not taken, to stop the inlets of all knowledge, to blind, or to confuse mankind! Effectually deceived, do not the greatest part of them thank their imaginary benefactors? Do they not too frequently pay the greater deference to men, in proportion as they propagate absurdities? And is it

seriously thought, that deceiving mankind is the real interest of society? Granting that a small portion of the human species be actually benefited by obscurity, do they think that the rest participate the advantage? Can men thus artfully blindfolded trace the windings of nature? Can we, short-sighted of ourselves, and hoodwinked by others, make any progress in philosophical researches? Can we, amid such confusion of ideas, though possessed of the disposition, accomplish the purpose of doing justice either to ourselves or to our fellow-creatures? Is it possible for us, under such wretched circumstances, to distinguish what is really right or wrong, to fix with precision the boundaries of morality?

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The inhabitants of a celebrated portion of the globe stile themselves the rational, the civilized, the intelligent of mankind. Yet, with all their boasted knowledge, are they not absurd enough to confine the existence of the world, and its vast appendages, the unbounded scenes of nature, to the trifling limits of a few thousand years? They have gazed at the written monuments of the East, at the hieroglyphics, and the pyramids of Egypt. They have adopted, as wonders of antiquity, the labours of men that existed but a few centuries before themselves. The records of immediate predecessors, they have made the bounds of antiquity. Children of a day, they have

given but a day to the existence of nature!

Prejudices too, which they are discerning enough to censure in others, lord it over their finer understandings. They laugh at the errors and gross superstitions of the rest of the world; yet, inexcusably, are they captivated with similar delusions. Enemies to liberal investigation, when the result of it seems to contradict their favoured opinions, they condemn often without examination, the labours of the sensible and discerning. Thus do they discourage the intelligent members of society, whose superior merit their prejudices suffer them not to discern. They insist upon it that the animals, the vegetables,

tables, the human species, the world itself, with all the magnificent scenes of nature, are but of some thousand years existence! Unwilling to depart from such degrading and unwarrantable conclusions, they are even disposed to censure those who vindicate the cause of nature and of truth. Innumerable are the monuments of the extensive influence of folly, and of the weakness and limited reach of human understanding!

In the circle of existence, in vain do we seek for the beginning of things. How absurd and fruitless every recourse to calculation on the subject of antiquity! The stretch of human conception necessarily fails us; a multiplied

tiplied series of numbers, of which we cannot possibly have any adequate idea, unavoidably leaves the matter removed at an unlimited distance. In short, ourselves, our lives, and calculations, are but points in time and in nature!

Is there not then some reason for us to suspect, what in these days rarely enters into the imagination of any man,

That there has ever been a succession of events, something similar to what is continually observed.

That nature must, through endless periods of duration, have acted by laws fixed and immutable.

That

DURATION OF THE WORLD. 187

That the human species have had,
and will have, an uniform and infi-
nite existence!

SECTION

The Twentieth.

HAVING thus endeavoured to give an insight into the nature of things; and having adduced variety of facts and reasonings, to obviate the contracted notions too universally prevailing; it may not now be amiss to make some general observations, which the nature of our subject unavoidably leads us to. In as explicit a manner then as possible, I shall endeavour to shew some of the causes, why the bulk of mankind have ever

ever received improper notions, both of themselves and of the objects everywhere surrounding them.

By nature, man is evidently impressed with an attachment to his own species, of the warmest kind. This stamp of nature's hand is indeed inseparable from life. Actuated by its influence, we cultivate every thing that seems to have a tendency to make mankind happy. Yet, in every trivial instance, under various disguises, this principle is too often found to degenerate into one more immediately selfish and contracted; and in this view, it has justly been considered as the first and most important spring of almost every action.

It

It is this prevailing love of self, which has separated man at so vast a distance from the beautiful works of nature; which has raised him in imagination to an high and lofty station in the scale of existence. Ask any one of the undistinguished mass of people, for what purpose every thing exists? The general answer is, that every thing was created for our particular use and accommodation! In this same manner, the world itself has been viewed in the erroneous light of a mansion, fitted up for the general preservation of animal and vegetable life. In short, the whole magnificent scene of things is daily and confidently asserted to be ultimately intended for the peculiar convenience of mankind.

Thus do the bulk of the human species vauntingly elevate themselves above the innumerable existences that surround them!

As far as possible, the philosopher should steer clear of circumstances, which mislead and fascinate the judgment. Let us then forsake this beaten track; again let us venture to surmise, that such immense portions of matter, as worlds and their varied modifications of animation, have ever existed. If it be necessary that worlds, vegetables and animals should exist, why not always? Here it is however proper to repeat, that the natural objects with which we are every where surrounded, when duly attended

attended to, seem strongly to point out, that one substance changes into another; that the particles of matter, constituting every species of existing substance, so far from being at rest, fluctuate in continual revolution; and that though men, animals, vegetables, earths, stones, minerals, ever have, and will exist; yet do they continually vary in their constituent parts.

Independent of the absolute certainty, that things change one into another; there is not a particle of existing substance, which may not seem to have itself participated of animal or vegetable life, or to have been derived from matter thus previously

previously animated? The reasonings of this enquiry incline us to think so. The marble, the chalk, the limestone, and the calcareous substance in general, evidently appear to derive their origin from testaceous matter, or the shells of marine animals, and from products of the coral kind. The stones, earths, and clays, of a different quality from the calcareous, would appear, from various circumstances and impressions, to be the genuine offspring of land animals and vegetables. Mineral substances, it is needless to repeat, are derived from rocks, where the matter they are composed of first exudes, and in process of time digests, and is brought to perfection; the

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rocks

rocks themselves being progressively formed from the spoils of vegetables and animals. Animal and vegetable existence then seem absolutely necessary to the production of the various substances that are met with; while those very substances are equally necessary to such animation. Thus will it be found, that the different parts of nature are mutually dependent on and resolvable one into another.

Yet, amid all this fluctuation of beings and events, amid the eternal transmutations or changes of one thing into another, an unerring uniformity is preserved throughout the whole of nature. That the particles

of matter entering into the composition of earths, animals, and vegetables form immutably similar productions, a permanency and sameness in the different qualities of earths, vegetables, and animals, sufficiently demonstrate. What difference, let me ask, is there between the composition of the animals and vegetables of today, and of those of the remotest period, under similar circumstances of climate and situation? The earths, mineral particles, waters, and materials entering into their compositions, vary not in their natures. For though earths, minerals, and waters themselves are gradually formed, and in time gradually decay; yet are there others reproduced with all their qualities.

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The revolutions of society,—the contention of nations,—the downfall of empires,—extinguish not the human species. Nor are the animals and vegetables of the extended scenes of nature in any degree threatened with total extermination. 'Tis true, extraordinary operations of nature at times partially affect their existence; but tumultuous scenes of devastation and calamity are usually succeeded by serene and happy periods of tranquillity, that compensate for destruction, and give ample scope to fertility and population. How incompatible with reason is it to suppose, that nature, whose every operation is stamped with wisdom and consistency, should give a fatal blow to her own existence, and in some measure extinguish

guish herself in the annihilation and destruction of animation !

The continual formation and decay of every existing substance, the unceasing circulation of matter that has been so copiously explained, produces no disorder. Innumerable beings exult in their existence but for a day, then droop, and change the mode of that existence ; yet do they each of them leave their different forms and species equally numerous and flourishing. A continual waste in every part is necessary to the incessant repairs of the whole. The closest sympathy and connection is preserved, throughout the entire system of things ; and each part or member

member of the universe, in performing its proper offices, operates both to its own preservation and to that of the whole.

Nor is the magnificence so universal and apparent—the beautiful order and disposition of the several parts that compose the stupendous whole—any objection to an unbounded succession of events. So far indeed from being an objection, they might undoubtedly be brought as the strongest confirmation of such a doctrine. Is it not far easier to conceive things to exist as they are, and to contain eternal order and regular disposition within themselves, than to have recourse to more magnificent causes, which,

which, after all, must be allowed to be eternal and self-existent? Were magnificence an objection to an eternal duration of things, is it reasonable to increase that magnificence, to remove the objection? If something always has existed, or must have been eternal,—why not pay a deference to the magnificent and beautiful objects of whose existence we are certain? why not grant eternity to nature?

The world, the universe itself, are composed of moveable particles, qualified for eternal agitation. If then numerous modifications of matter thus exist; if events similar to those already described, daily do take place; what in the nature of things should hinder
such

such events from having always happened?

Nature is invariably the same, her laws eternal and immutable. Substances that seem inanimate are yet perpetually in action, admit of changes regular and uniform: and as the vegetables rise and fall, and men exist and die, thus they have ever done, and ever will do.



F I N I S.

